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(56) Documents Cited

GB 2208315 A

GB 2166333 A

GB 2126093 A

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GB 2011774 A

GB 0357523 A

(58) Field of Search

UK CL (Edition N ) A1M MFA MFB MFC MFH , A5R  
RCAX

INT CL<sup>6</sup> A01K

Online databases:- wpi

## (54) Poultry egg processing method

(57) Poultry eggs are collected from nesting houses (Fig 3) and delivered to a sanitising station (Fig 7) where they are passed through sprays 56 of an anti-bacterial solutions 55. The eggs are mounted on mobile racks and delivered to a fumigating room (Fig 8a, 86). After fumigation, the eggs are held in a setting room (Fig 9) at a controlled temperature and humidity, the eggs being regularly turned within the setting room (see Fig 10). Downstream of the setting room 72 at a checking station (Figs 11 + 12) trays of eggs are back lit to check fertility, infertile eggs being discarded. The fertile eggs are transferred into hatching trays by means of a suction cup matrix 92 and incubated, male and female chicks are separated. Selected chicks are delivered to a vaccinating station (Figs 15-17) for vaccination, and then to delivery trays 112 Fig 20. Apparatus for washing trays is disclosed at Figs 18-19.

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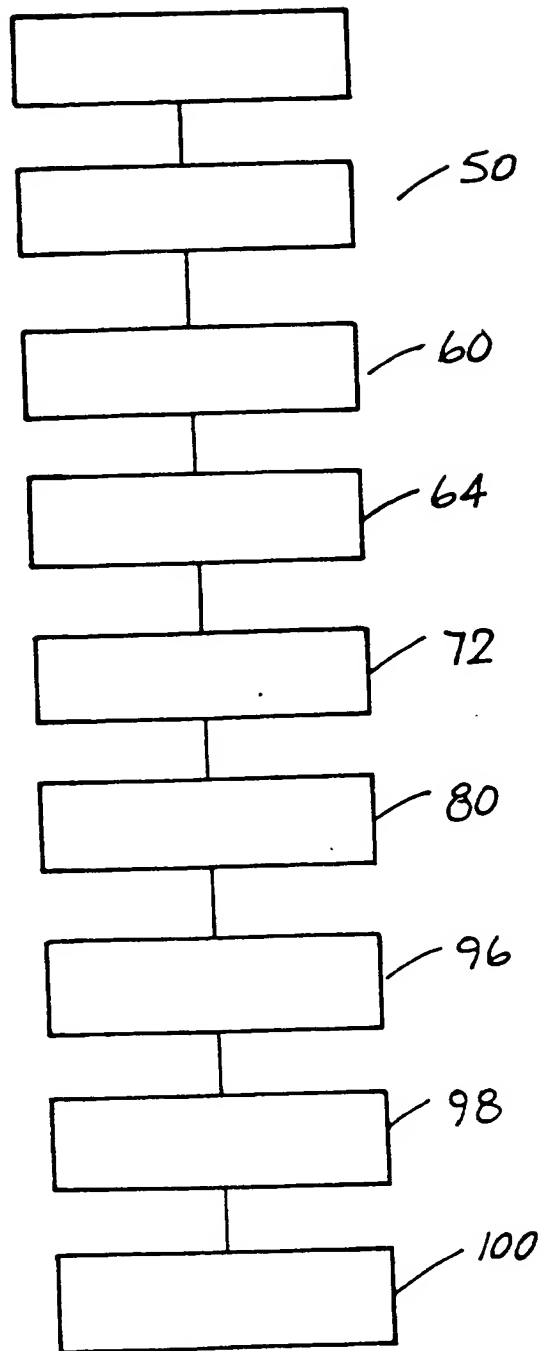


Fig. 1

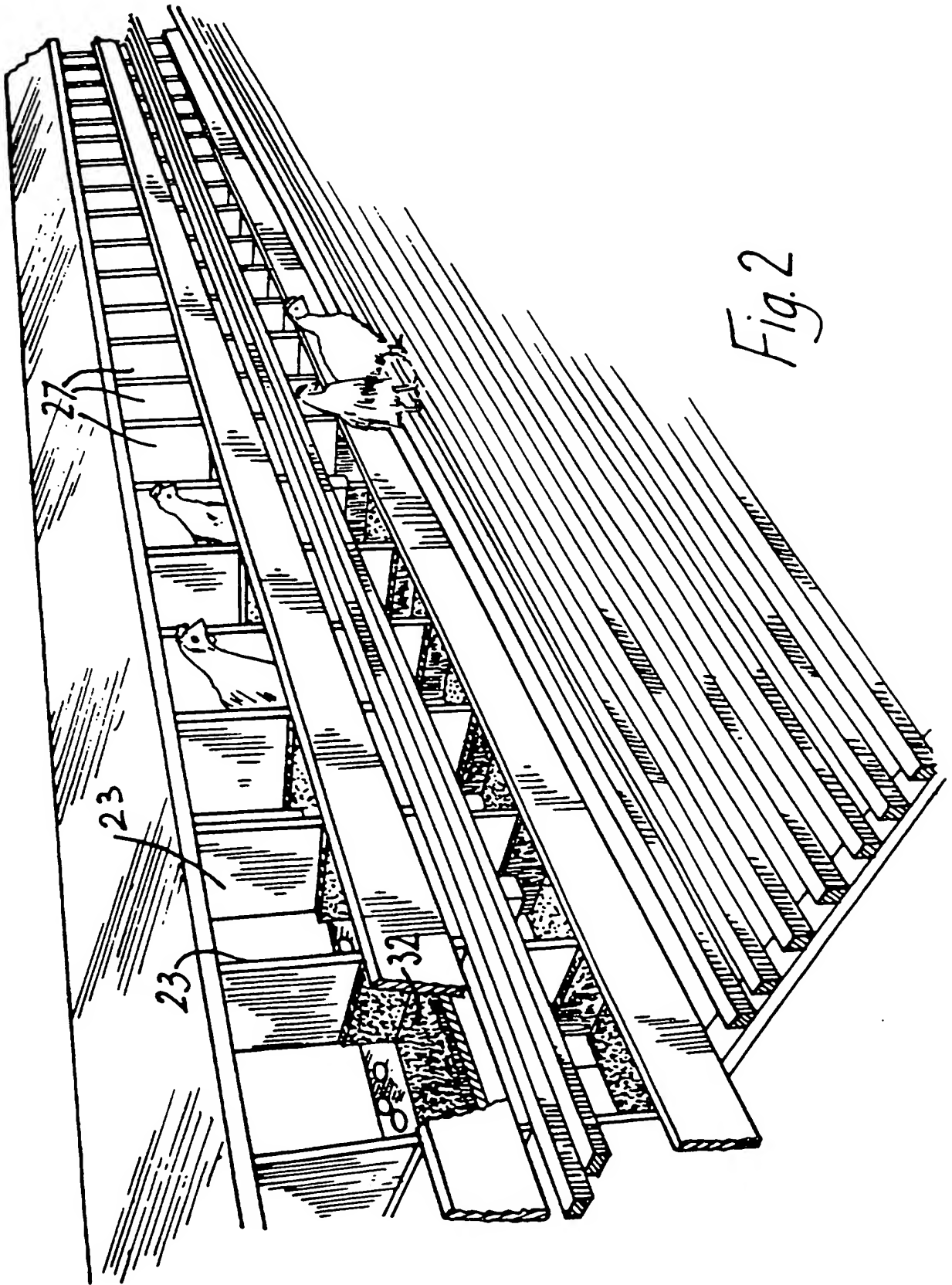
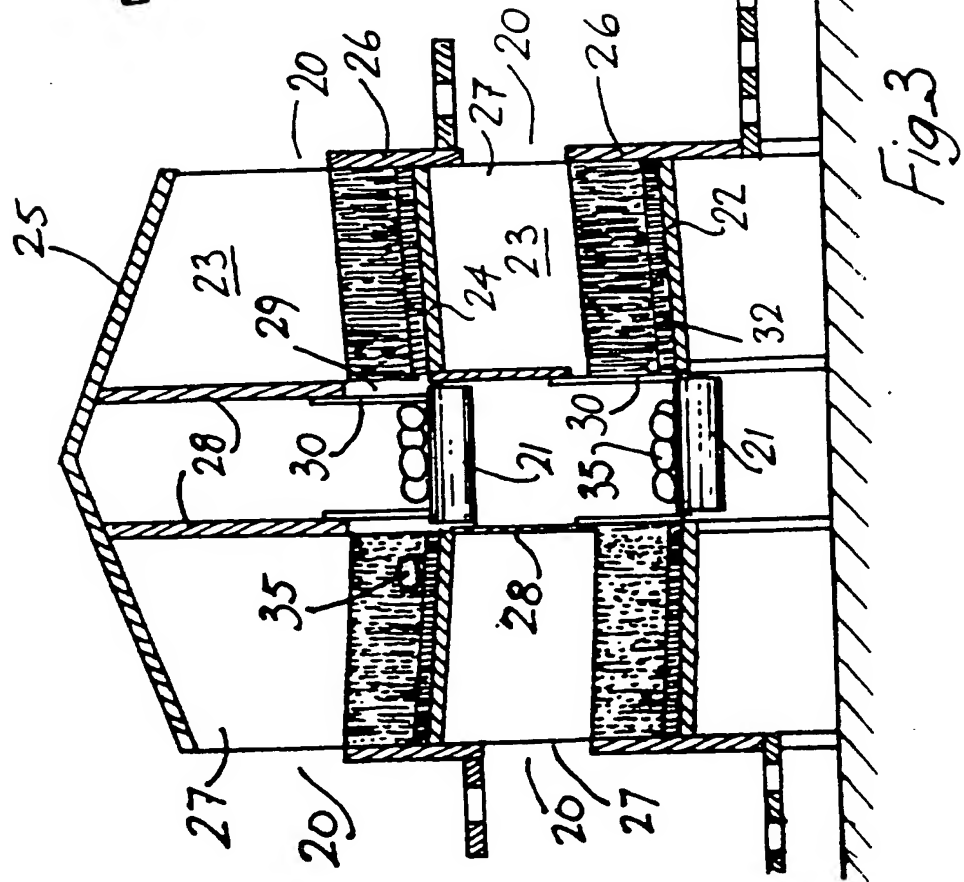
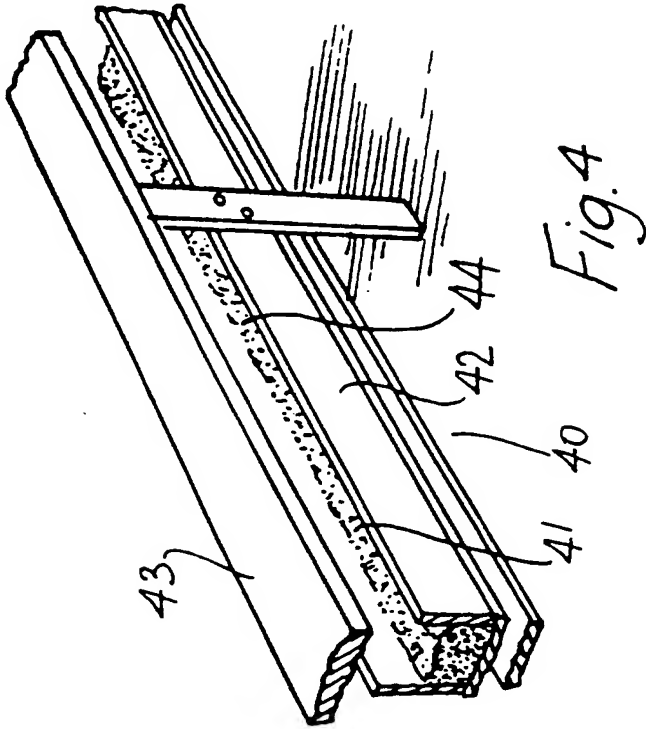


Fig. 2



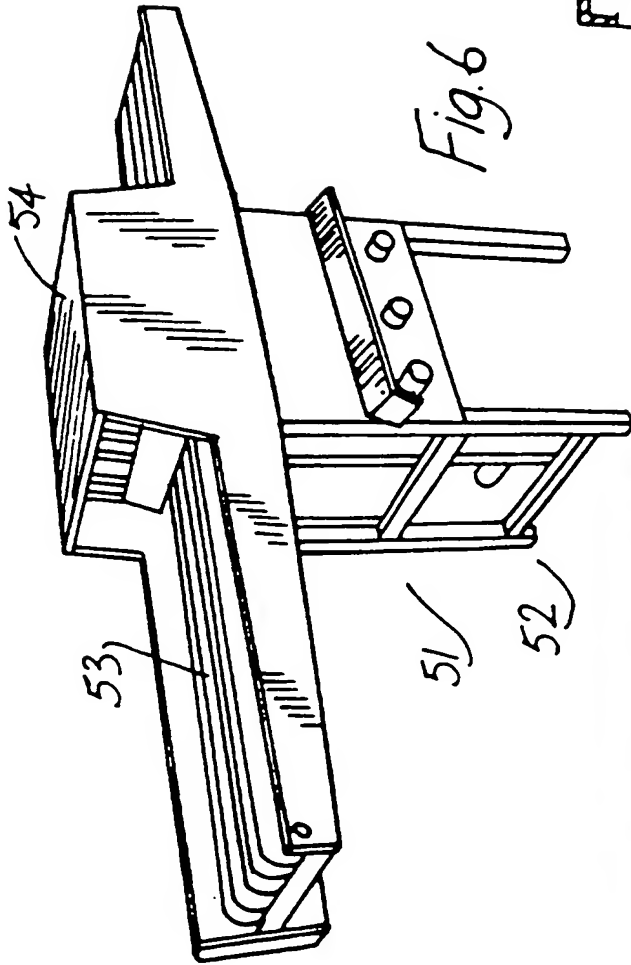


Fig. 5

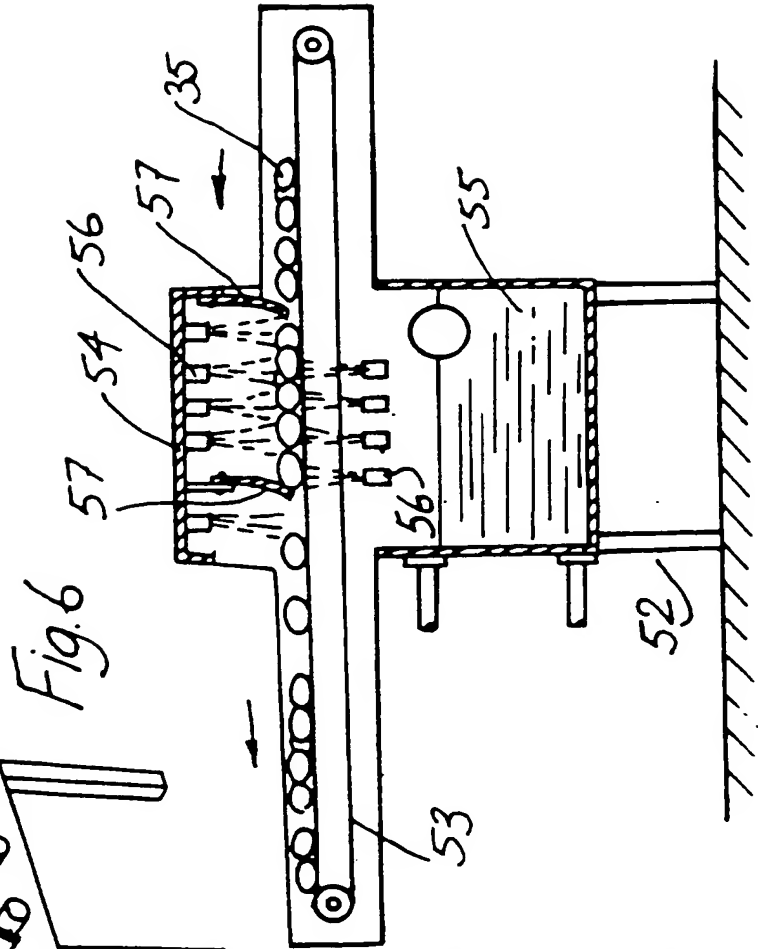


Fig. 6

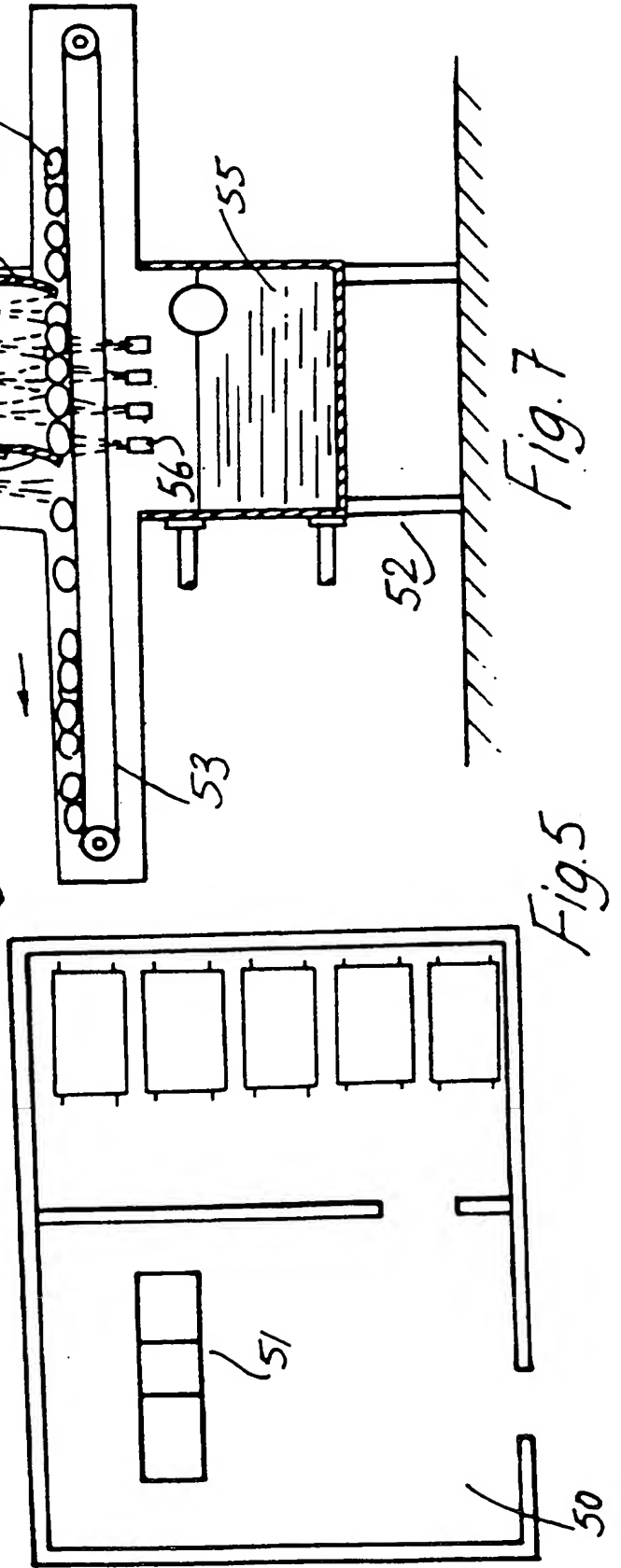


Fig. 7

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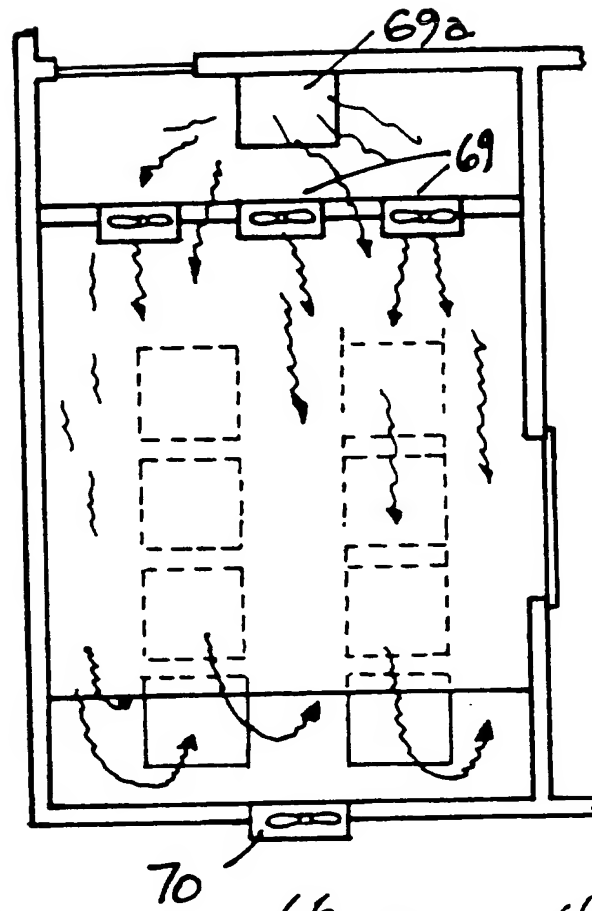


Fig. 8b

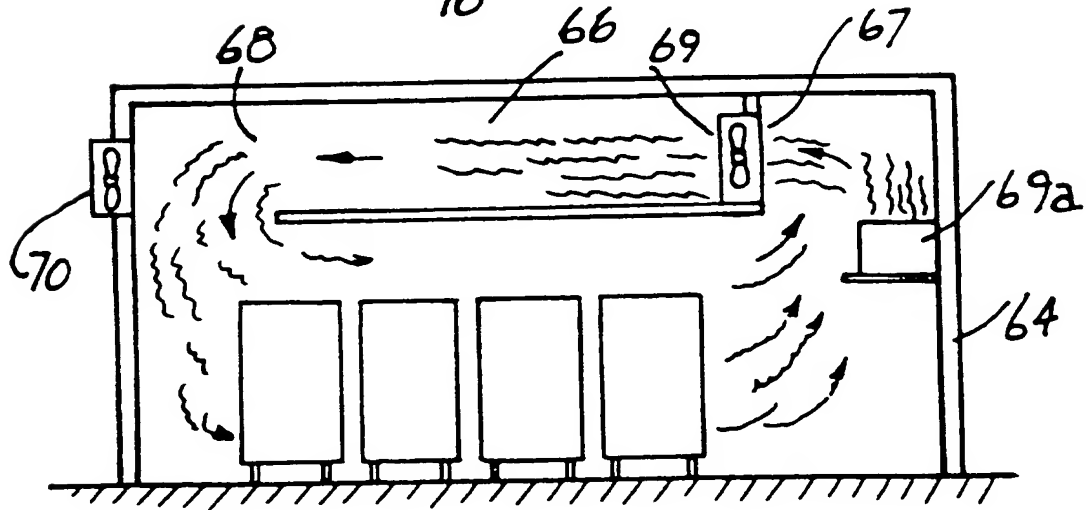


Fig. 8a

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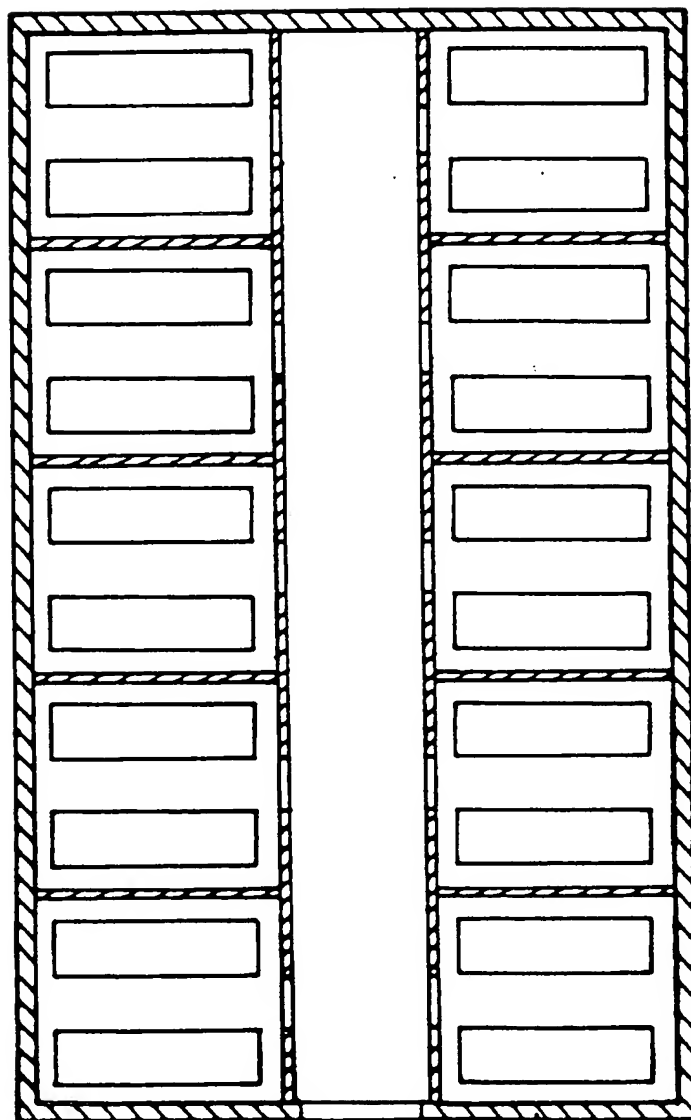


Fig. 9

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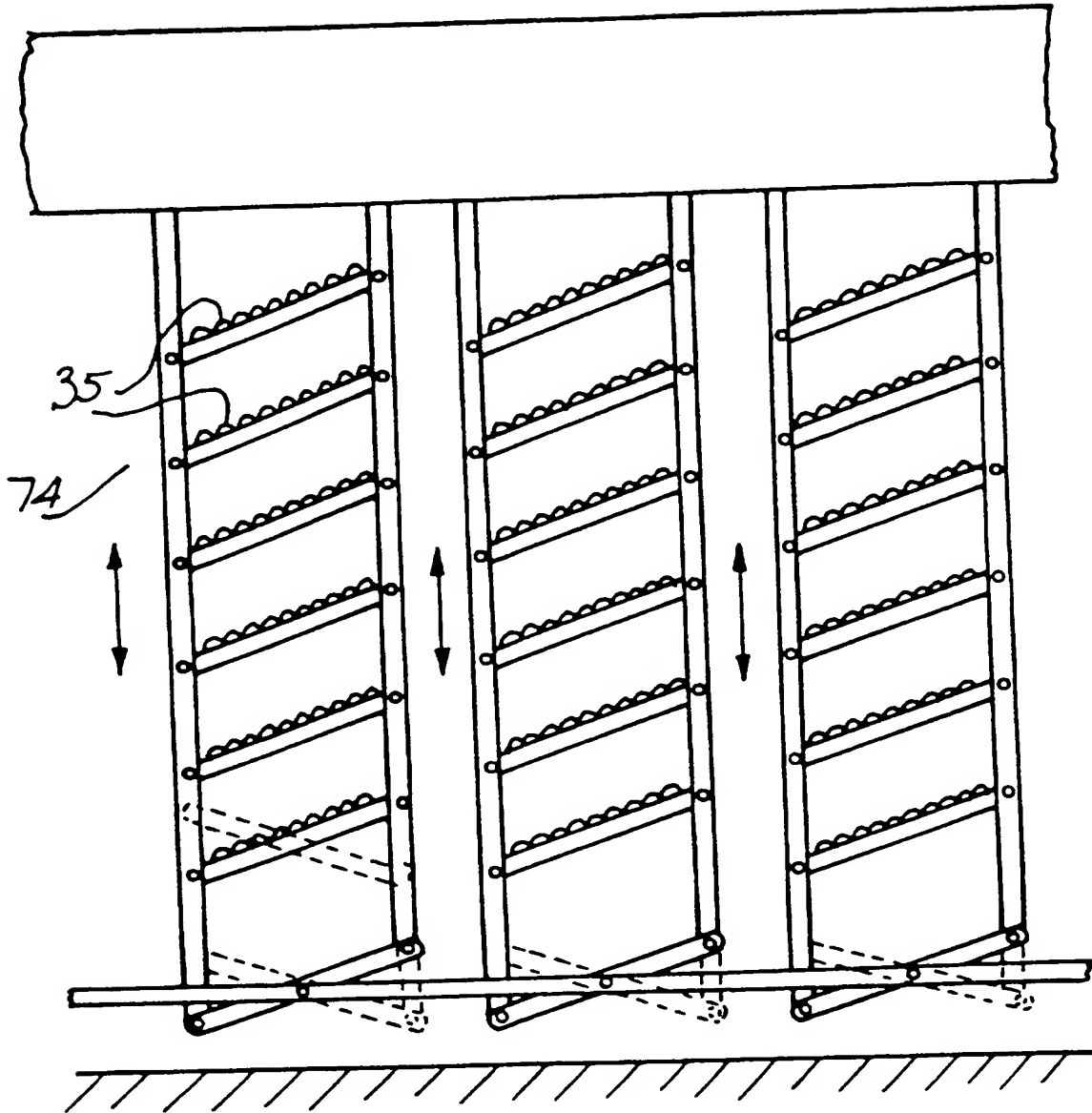


Fig. 10



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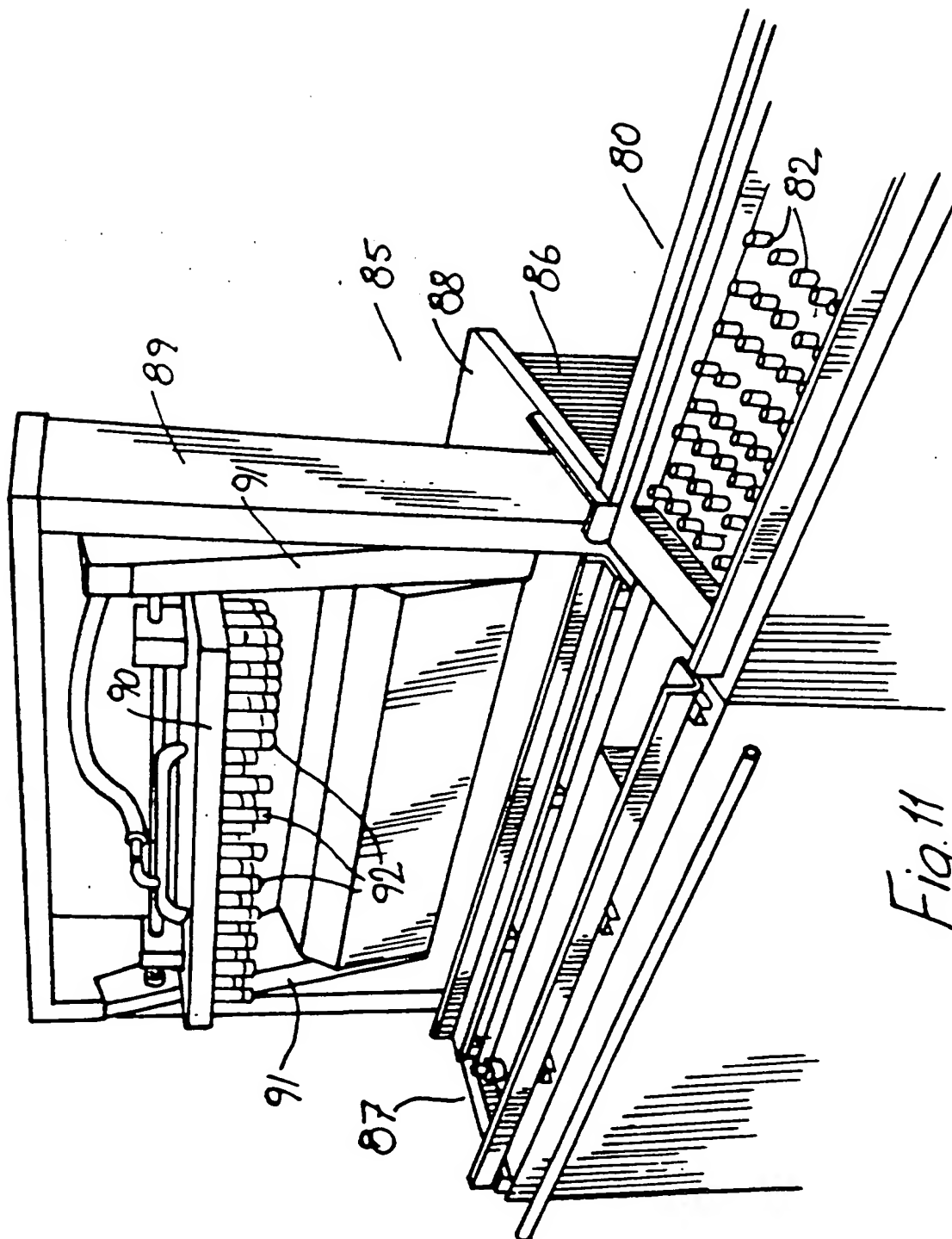
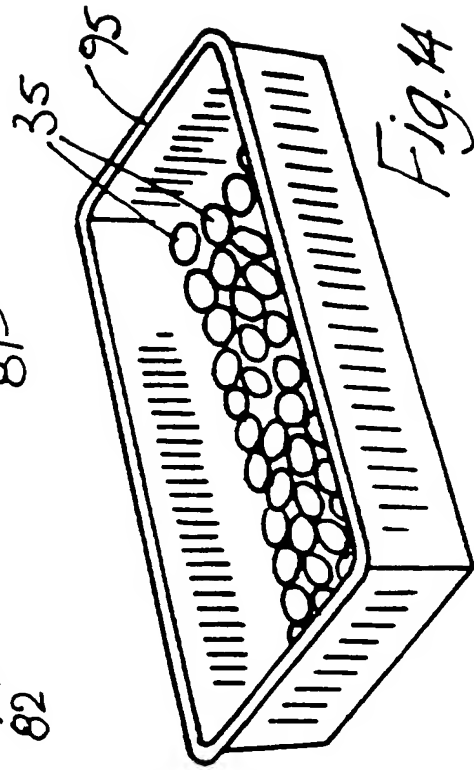
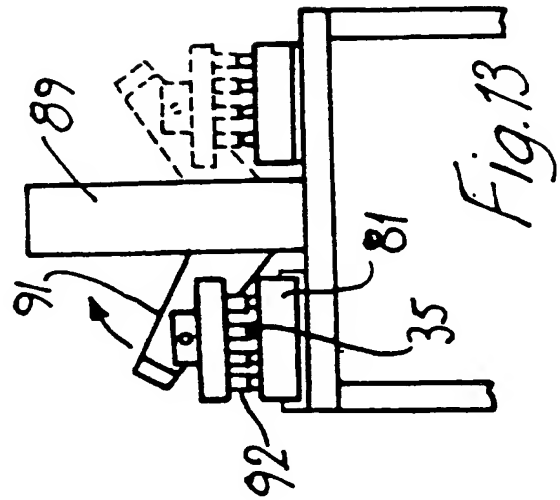
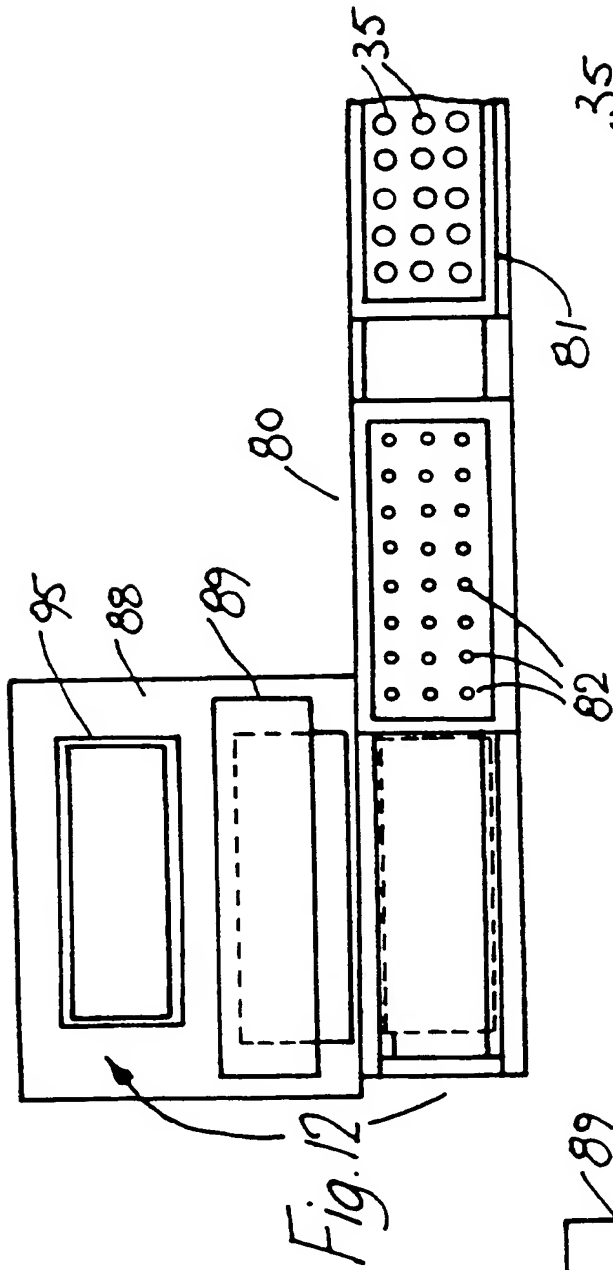


Fig. 11

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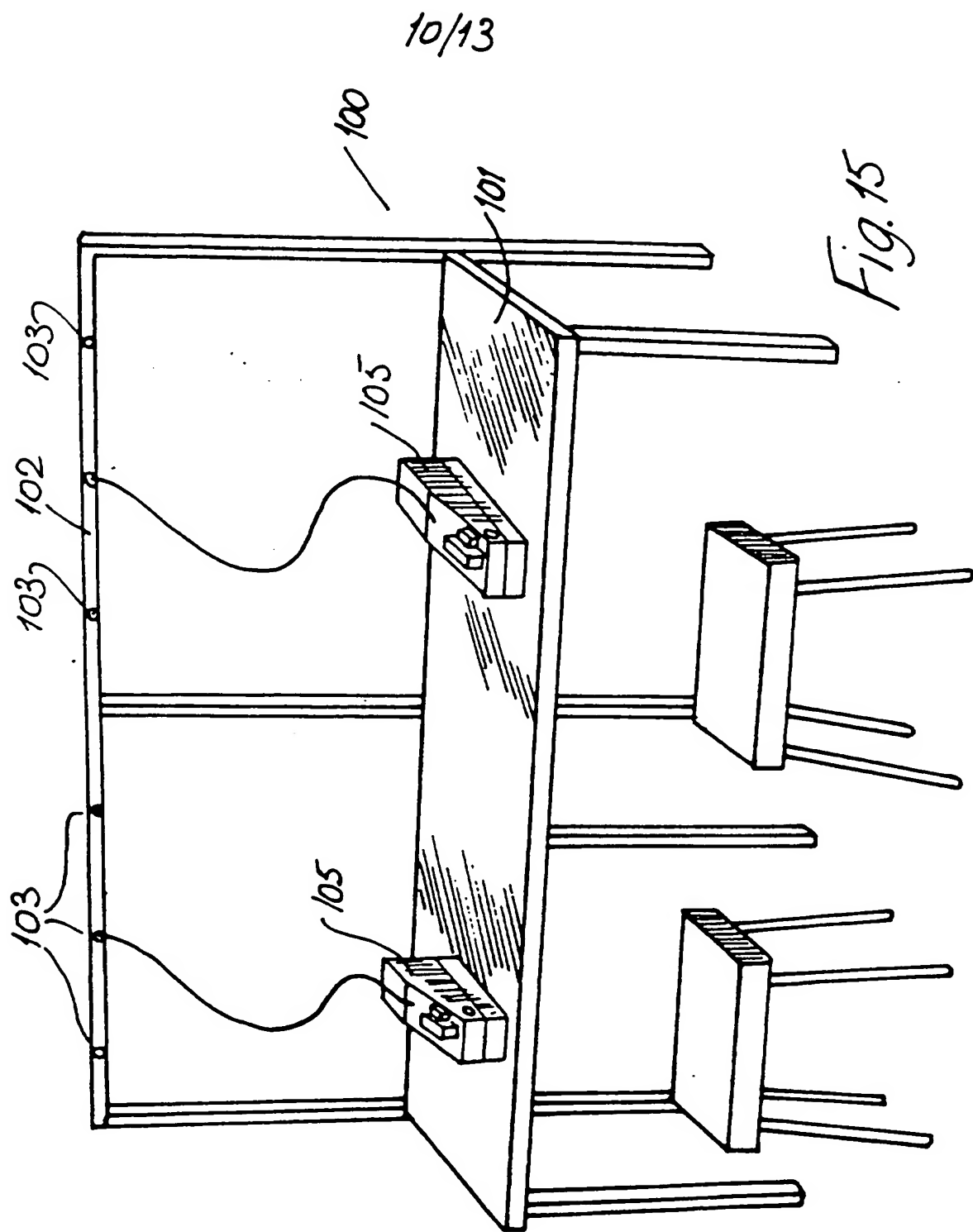


Fig. 15

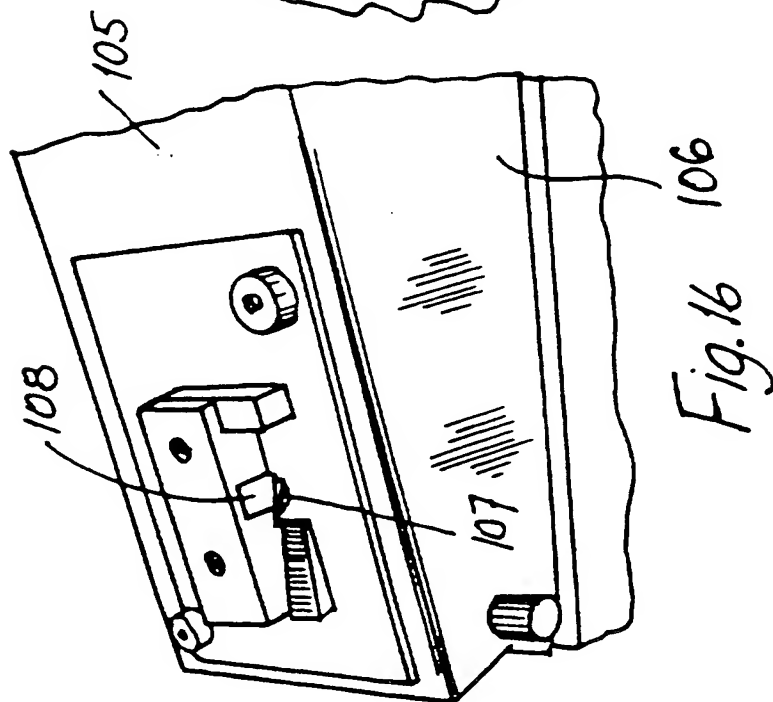


Fig. 16

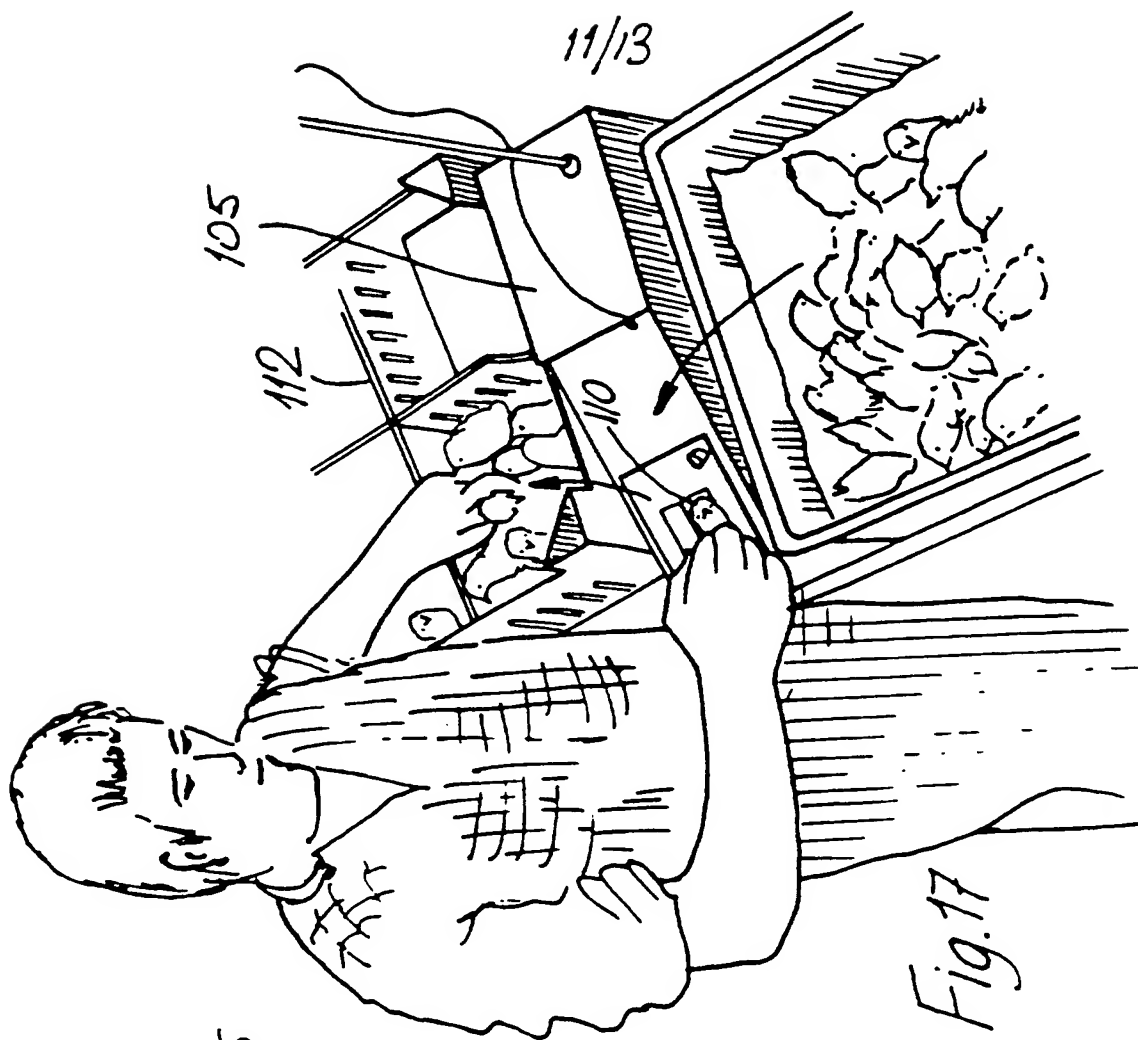
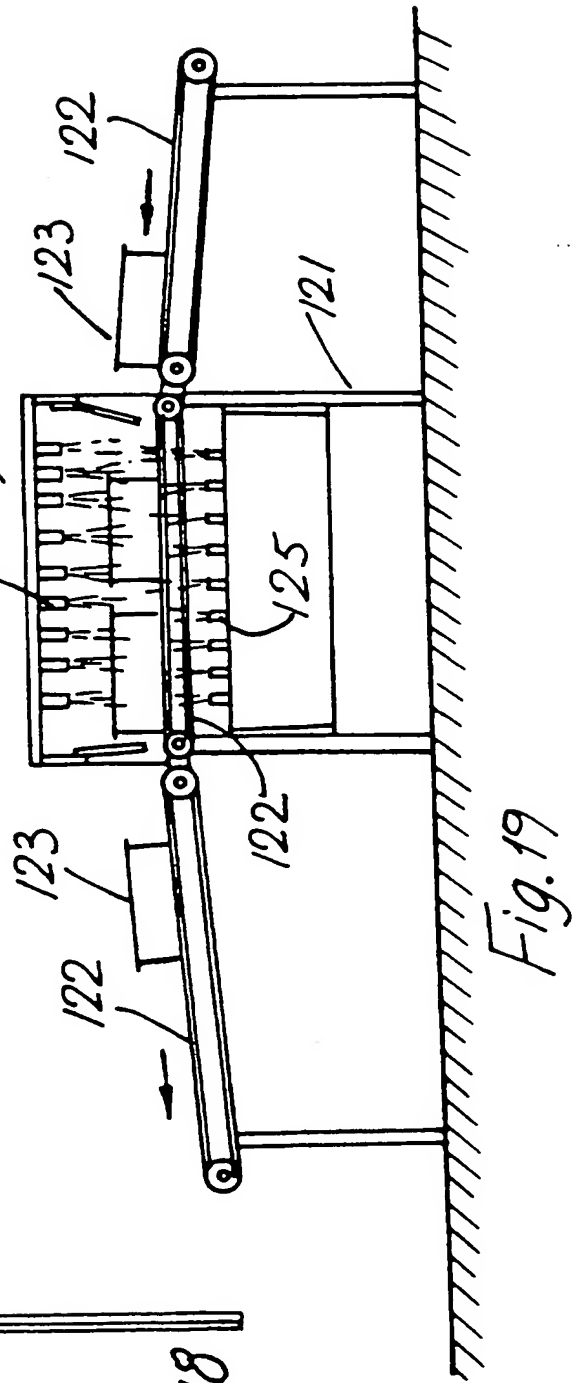
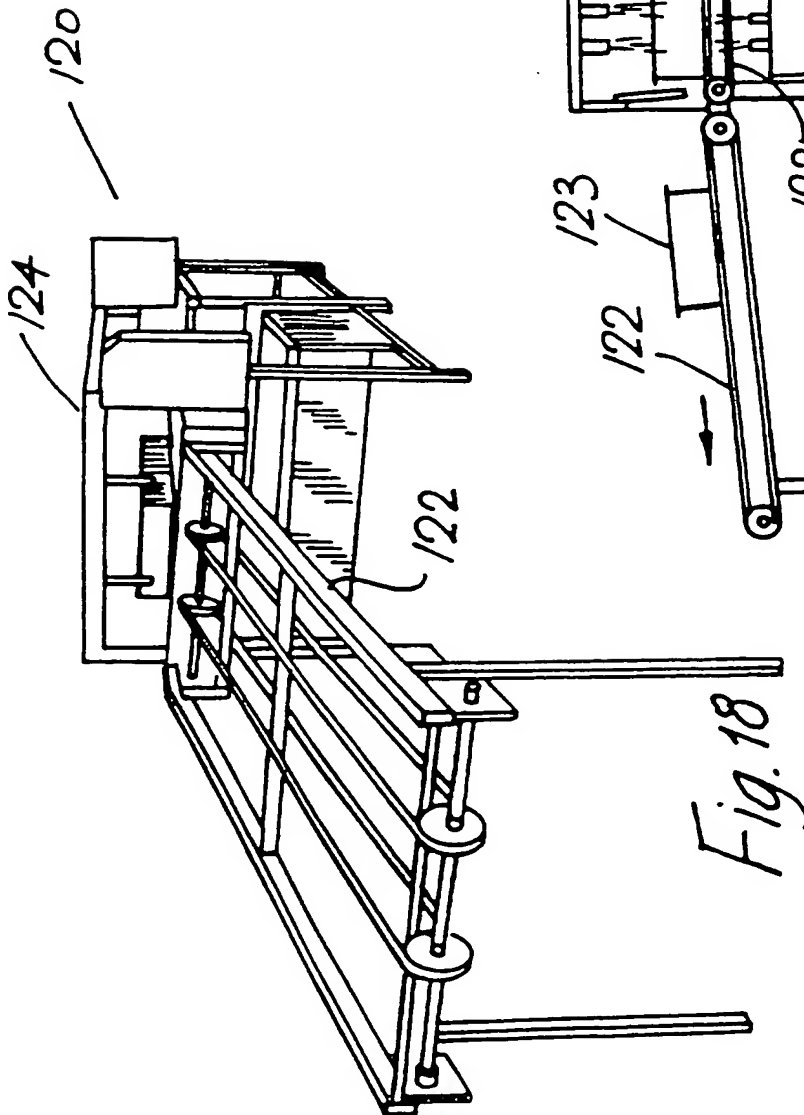
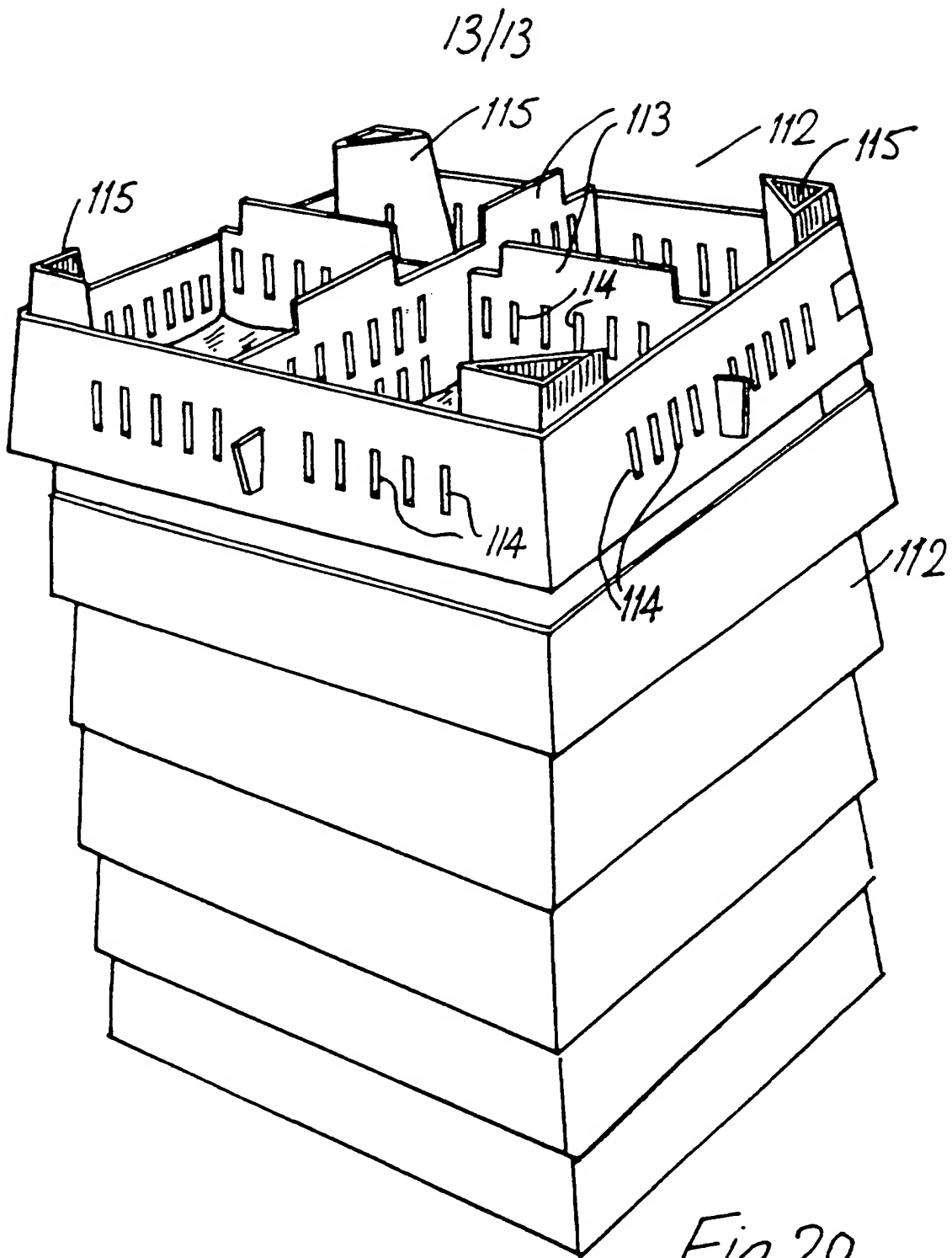


Fig. 17

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"A poultry egg processing system"

This invention relates to a poultry egg processing system.

According to the invention, there is provided a poultry egg processing system comprising the steps:-

5                   arranging a batch of eggs spaced-apart on trays,  
                  stacking the trays vertically spaced-apart on a  
                  mobile rack,

                  delivering the rack to a holding store,  
                  maintaining the atmosphere within the holding  
10                  store at a pre-selected desirable temperature and  
                  humidity,

                  delivering the eggs on the mobile racks to a  
                  fumigating room, sealing the fumigating room and  
                  circulating a fumigant gas within the fumigating  
15                  room for a preset period and then evacuating the  
                  fumigant gas from the fumigating room,

                  delivering the eggs to a setting room, maintaining  
                  the atmosphere within the setting room at a  
                  preselected temperature and humidity for a preset  
20                  period, periodically turning the eggs within the  
                  setting room,

                  conveying each tray to a checking station,  
                  checking each egg to confirm the fertility of the  
                  egg, infertile eggs being discarded, any infertile  
                  eggs on each tray being replaced by fertile eggs,

25                  delivering each checked tray in turn to an inlet  
                  of an egg transfer device, the egg transfer device  
                  having a movable transfer head with a matrix of

5 suction cups corresponding to the eggs on the tray  
to engage each egg on a tray and upon application  
of a vacuum to each suction cup lifting the eggs  
together from the tray and moving the transfer  
head to an outlet of the egg transfer device,  
depositing the eggs in a hatching tray mounted at  
the outlet,

10 conveying the hatching tray to a hatching room,  
maintaining the atmosphere within the hatching  
room at a preset desirable temperature and  
humidity to hatch chicks from the eggs,

delivering the chicks to a sexing station and  
separating male and female chicks at the sexing  
station,

15 transferring chicks to a vaccinating station, the  
vaccinating station comprising a table having a  
pressurised air supply manifold extending along a  
rear side of the table above the table with a  
number of air outlets spaced-apart along the  
20 manifold, the manifold having means for connection  
to a pressurised air supply, one or more  
pneumatically operated vaccine injection devices  
being mounted on the table and connected to an air  
outlet, each vaccine injection device having an  
25 injection needle movable between a retracted  
stored position and an extended injecting position  
for injection of a single dose of vaccine into  
each chick, and

30 arranging a selected number of vaccinated chicks  
in delivery trays.



In one embodiment of the invention, prior to arranging a batch of eggs on trays of collecting poultry eggs from a poultry nesting house, delivering the eggs to a sanitising station, at the sanitising station conveying the eggs  
5 through sprays of an anti-bacterial solution for cleaning the eggs.

In a preferred embodiment the eggs are collected from poultry nesting boxes in the poultry nesting house, each nesting box having an inclined base, a pair of upstanding  
10 side walls at opposite sides of the base, a cover mounted between the side walls above the base, a front wall upstanding at a front of the base and extending partially up the side walls leaving a hen inlet opening between a top of the front wall and the cover, a rear wall mounted  
15 between the side walls and extending downwardly towards the base with an egg outlet opening between a bottom of the rear wall and the base, said egg outlet opening closed by a resilient flap, the base being covered by a mat, each box being mounted adjacent an egg collecting conveyor such  
20 that an egg laid in a box rolls down the mat through the outlet opening onto the conveyor.

In a further embodiment, the process includes the step of feeding hens within the poultry nesting house by delivering feed on a feed conveyor through the poultry  
25 nesting house, the feed conveyor travelling within a trough having a cover with a feeding opening sized for allowing access of a hen's head for feeding but preventing cocks feeding at the trough, a separate feeding trough being provided for cocks.

30 In another embodiment the fumigating room has a false ceiling with an inlet opening at one end of the fumigating room and an outlet opening at the opposite end of the fumigating room, a circulating fan being mounted at the

inlet opening for circulating the fumigant gas through the false ceiling and the fumigated room.

5 In another embodiment after fumigation and prior to delivery of eggs to setting room, the process includes the step of heating the fumigating room to a desired temperature for pre-heating the eggs before delivery to the setting room.

10 In a further embodiment at the checking station the eggs are checked by positioning each tray of eggs in turn over a matrix of lamps corresponding to the eggs on the tray to simultaneously back-light each egg on the tray for indicating the fertility of the eggs.

15 In another embodiment the process includes the step of washing the trays at a tray washing station after use by conveying each tray through sprays of detergent solution and then conveying the tray through sprays of a disinfectant solution.

20 The invention will be more clearly understood by the following description of some embodiments thereof, given by way of example only, with reference to the accompanying drawings, in which:-

Fig. 1 is a schematic flow chart illustrating a poultry egg processing system according to the invention;

25 Fig. 2 is a perspective view showing a row of nesting boxes used in one embodiment of the system;

Fig. 3 is a sectional, end elevational view of the nesting boxes shown in Fig. 2;

Fig. 4 is a detail, perspective view of a feeding trough for use in the system;

Fig. 5 is a schematic plan view of a sanitising station used in the process;

5 Fig. 6 is a perspective view of a sanitising device used in the system;

Fig. 7 is a schematic side sectional elevational view of the sanitising device shown in Fig. 6;

10 Fig. 8a is a schematic side sectional elevational view of a fumigating room used in the system;

Fig. 8b is a schematic plan view of the fumigating room;

Fig. 9 is a schematic plan view of a setting room used in the process;

15 Fig. 10 is a detail, front elevational view showing tilting racks forming portion of the setting room of Fig. 9;

Fig. 11 is a perspective view of an egg transfer device used in the system;

20 Fig. 12 is a plan view of the egg transfer device;

Fig. 13 is an end, elevational view of the egg transfer device;

Fig. 14 is a perspective view of a hatching tray used in the system;

Fig. 15 is a perspective view of a vaccinating station used in the system;

Fig. 16 is a detail, perspective view of a vaccinating device used in the system;

5        Fig. 17 is a perspective view showing the vaccinating device in use;

Fig. 18 is a perspective view of a tray washing device used in the system;

10       Fig. 19 is a diagrammatic, side sectional, elevational view of the tray washing device; and

Fig. 20 shows a stack of chick delivery trays used in the system.

Referring to the drawings, a poultry egg processing system according to the invention will be described.

15       Eggs are collected from a poultry nesting house. The nesting house has a plurality of nesting boxes in which hens lay eggs for collection. While the eggs may be manually collected, a preferred egg collection system is shown in Figs. 2 and 3. In this arrangement, a plurality  
20       of nesting boxes 20 are arranged in two rows, one above the other, at one side of an egg collecting conveyor 21. Preferably, two sets of nesting boxes 20 back on to a collecting conveyor 21 as shown in Fig. 3. Each nesting box 20 has an inclined base 22. A pair of upstanding side  
25       walls 23 are provided at opposite sides of the base 22. A cover 24, 25 is mounted between the side walls 23 above the base 24. A front wall 26 is upstanding at a front of the base 22 extending partially up the side walls 23 leaving a hen inlet opening 27 between a top of the front

wall 26 and the cover 24, 25. A rear wall 28 is mounted between the side walls 23 and extends downwardly from the cover 24, 25 towards the base 22 with an egg outlet opening 29 being formed between a bottom of the rear wall 28 and the base 22. The outlet opening 29 is closed by a resilient flap 30 mounted at a lower end of each rear wall 28. The base 22 is covered by a mat 32, preferably of Astro-turf<sup>RTM</sup> material, the mat 32 extending partly up each side wall 23. It will be noted that each base 24 is inclined inwardly and downwardly from the front wall 26.

In use, when a hen lays an egg in one of the nesting boxes 20, the egg 35 will roll down the mat 32 under the flap 30 and onto the conveyor 21, the conveyor delivering the eggs 35 to a collecting station where they are mounted in trays. It will be appreciated that, advantageously the use of the Astro-turf<sup>RTM</sup> mat 32 is comfortable for the hens and it is also relatively easy to keep clean. Further, as the eggs roll down the mat 32 when they are laid and immediately taken away by the conveyor 21 minimal dirt is picked up by the eggs 35.

Referring to Fig. 4, a feed conveyor 40 is shown for delivering feed through the poultry nesting house. The feed conveyor carries feed 41 within an elongate trough 42. The trough 42 has a cover 43 mounted spaced above the trough 42 leaving a feeding opening 44 along each side of the trough 42. The feeding opening 44 is sized such that a hen can insert her head through the opening 44 to feed at the trough 42, however, the opening 44 is too narrow for a cock to feed at the trough 42, separate feeding troughs being provided for cocks. Thus, advantageously the cocks cannot steal the hens feed, the hens thus being assured an adequate diet to encourage optimum egg laying.

Collected eggs are delivered to a sanitising station 50. At the sanitising station 50, the eggs are delivered through a sanitising device 51 for cleaning the eggs. The sanitising device 51 comprises a ground engaging frame 52  
5 carrying an endless conveyor 53. A spray booth 54 is mounted intermediate the ends of the conveyor 53. The spray booth 54 has a storage tank 55 for an anti-bacterial solution and pump means (not shown) for pumping said anti-bacterial solution through spray nozzles 56 mounted above  
10 and below the conveyor 53 which is of open mesh construction. Flaps 57 at an inlet and outlet of the spray booth 54 retain the spray within the spray booth. Cleaned eggs are picked from an outlet end of the conveyor and arranged spaced-apart on trays. A number of the trays  
15 are stacked vertically spaced-apart on a mobile rack (not shown).

The racks are delivered to a holding store 60 within which the temperature and humidity are controlled, the temperature being in the range 55-60°F and the humidity  
20 approximately 75%.

On demand, the racks of eggs are delivered to a fumigating room 64. Upon sealing the fumigating room 64, a fumigant gas is circulated within the room for a desired period, typically 30 minutes. The fumigating room 64 has a false  
25 ceiling 66 with an inlet 67 at one end of the fumigating room 64 and an outlet opening 68 at the opposite end of the fumigating room 64. A fan 69 is mounted at the inlet opening 67 to circulate fumigant gas through the false ceiling 66 and the fumigating room 64. The fumigant gas  
30 is discharged from a container 69a mounted on a side wall of the room adjacent the inlet 67 of the false ceiling 66. After fumigation, an extraction fan 70 evacuates the fumigant gas from the fumigating room 64.

Preferably then the temperature within the fumigating room 64 is raised to a temperature of approximately 37°C to pre-heat the eggs. The fan 70 has an associated heating coil to heat air circulated within the fumigating room 64 to  
5 raise the temperature.

The eggs are then delivered from the fumigating room 64 to a setting room 72. Within the setting room, the atmosphere is maintained at a temperature of approximately 37.4°C and humidity of about 60-65% for a period of 18  
10 days. The eggs 35 are mounted on tilting racks 74 which are operable to turn the eggs on a regular basis, typically every hour.

Upon removal from the setting room 72, the eggs are delivered to a checking station 80. At the checking  
15 station 80, each tray of eggs is checked in turn by positioning the tray 81 within eggs 35 over a matrix of lamps 82 corresponding to the eggs 35 to simultaneously back-light each egg 35 on the tray 81 to give an indication of the fertility of the egg. The light will  
20 shine through infertile eggs and any infertile eggs are removed from the tray and replaced by a fertile egg. The tray 81 is then delivered to an egg transfer device 85.

The egg transfer device 85 has a ground engaging frame 86 with an inlet platform 87 and outlet platform 88. Mounted  
25 between the platforms 87, 88 is a support 89 on which an egg transfer head 90 is pivotally mounted by arms 91. The egg transfer head 90 has a matrix of suction cups 92 corresponding to the eggs on the tray 81 to engage each egg on the tray 81 and upon application of a vacuum to  
30 each suction cup 91, all the eggs are simultaneously lifted from the tray and by pivoting the arms 91, the transfer head 90 is located over the discharge platform 88 for deposition of the eggs in a hatching tray 95.

A number of the hatching trays 95 are delivered to a hatching room 96. The atmosphere within the hatching room is maintained at a temperature of about 36.5°C and humidity of about 60-65% typically for about 3 days to hatch the chicks from the eggs.

Upon removal of the chicks from the hatching room 96, they are delivered to a sexing station 98 at which the male and female chicks are separated.

Chicks which are to be used for further breeding are then delivered to a vaccinating station 100. Prior to delivery of male chicks to the vaccinating station 100, they are de-spurred, de-combed and de-toed.

Referring to Figs. 15 to 17, the vaccinating station 100 has a stainless steel table 101. A pressurised air supply manifold 102 extends along a rear side of the table 101 above the table 101 and the air supply manifold is provided with a number of air outlets 103 spaced-apart along the manifold 102. The manifold 102 has means (not shown) for connection to a pressurised air supply. A number of pneumatically operated vaccine injection devices 105 are mounted on the table 101 and connected to air outlets 103. Each vaccine injection device 105 has a housing 106 within which a vaccine injecting needle 107 is mounted. The needle 107 is mounted on a carriage (not shown) for movement between a retracted stored position within the housing 106 and an extended injecting position in which a tip of the needle 107 projects through an associated opening 108 in the housing 106 for injection of a single dose of vaccine into a chick held against the opening 108. Upon holding a chick 110 at the opening 108 as shown in Fig. 17, a proximity switch operates the



needle to advance and inject the chick which is then removed and deposited in a delivery tray 112.

5 Delivery trays 112 are shown in more detail in Fig. 20 and comprise stackable cardboard boxes having divider panels 113 which separate an interior of the boxes into four compartments, a number of chicks being deposited in each compartment. Ventilation holes 114 are provided in sides of the box 112 and in the partitions 113. Projections 115 at each corner of the box and on the partitions 113 support each box 112 with an opening between a rim of each side wall and a bottom of the box placed above it. In some cases, plastics delivery trays may be provided.

15 Referring to Figs. 18 and 19, a tray washing station 120 is shown for washing trays after use. The washing station 120 has a base frame 121 on which endless conveyors 122 are mounted to deliver trays 123 up to, through and away from a spray booth 124. The spray booth 124 has a number of spray nozzles 125 above and below the central conveyor 122 for initially spraying a detergent solution at the trays 123 and then spraying a disinfectant solution at the trays 123 prior to discharge of the trays 123.

25 It will be appreciated that the invention provides a poultry egg processing system in which the risk of infection and disease is minimised due to the manner in which the eggs are handled throughout the process. Further, the feeding apparatus ensures the hens are well fed for optimum egg production. Also the nest box arrangement and egg collecting apparatus is such that the eggs when laid are immediately removed to prevent damage and prevent or minimise soiling of the eggs. The construction of the fumigating room ensures large numbers of eggs can be readily easily and quickly fumigated and also allows pre-heating of the eggs prior to delivery to

the setting room to minimise temperature and humidity fluctuation when loading a new batch of eggs in the setting room. At the vaccinating station, large numbers of chicks can be efficiently inoculated in a speedy manner.

5

The invention is not limited to the embodiments hereinbefore described which may be varied in both construction and detail.

CLAIMS

1. A poultry egg processing system comprising the steps:-

5 arranging a batch of eggs spaced-apart on trays,  
stacking the trays vertically spaced-apart on a  
mobile rack,

delivering the rack to a holding store,  
maintaining the atmosphere within the holding  
store at a pre-selected desirable temperature  
10 and humidity,

delivering the eggs on the mobile racks to a  
fumigating room, sealing the fumigating room and  
circulating a fumigant gas within the fumigating  
room for a preset period and then evacuating the  
15 fumigant gas from the fumigating room,

delivering the eggs to a setting room,  
maintaining the atmosphere within the setting  
room at a preselected temperature and humidity  
for a preset period, periodically turning the  
20 eggs within the setting room,

conveying each tray to a checking station,  
checking each egg to confirm the fertility of  
the egg, infertile eggs being discarded, any  
infertile eggs on each tray being replaced by  
25 fertile eggs,

delivering each checked tray in turn to an inlet  
of an egg transfer device, the egg transfer  
device having a movable transfer head with a  
matrix of suction cups corresponding to the eggs

5 on the tray to engage each egg on a tray and upon application of a vacuum to each suction cup lifting the eggs together from the tray and moving the transfer head to an outlet of the egg transfer device, depositing the eggs in a hatching tray mounted at the outlet,

10 conveying the hatching tray to a hatching room, maintaining the atmosphere within the hatching room at a preset desirable temperature and humidity to hatch chicks from the eggs,

delivering the chicks to a sexing station and separating male and female chicks at the sexing station,

15 transferring chicks to a vaccinating station, the vaccinating station comprising a table having a pressurised air supply manifold extending along a rear side of the table above the table with a number of air outlets spaced-apart along the manifold, the manifold having  
20 means for connection to a pressurised air supply, one or more pneumatically operated vaccine injection devices being mounted on the table and connected to an air outlet, each vaccine injection device having an injection  
25 needle movable between a retracted stored position and an extended injecting position for injection of a single dose of vaccine into each chick, and

30 arranging a selected number of vaccinated chicks in delivery trays.

2. A system as claimed in claim 1 further including the steps, prior to arranging a batch of eggs on trays of collecting poultry eggs from a poultry nesting house, delivering the eggs to a sanitising station, at the sanitising station conveying the eggs through sprays of an anti-bacterial solution for cleaning the eggs.
3. A system as claimed in claim 2 wherein the eggs are collected from poultry nesting boxes in the poultry nesting house, each nesting box having an inclined base, a pair of upstanding side walls at opposite sides of the base, a cover mounted between the side walls above the base, a front wall upstanding at a front of the base and extending partially up the side walls leaving a hen inlet opening between a top of the front wall and the cover, a rear wall mounted between the side walls and extending downwardly towards the base with an egg outlet opening between a bottom of the rear wall and the base, said egg outlet opening closed by a resilient flap, the base being covered by a mat, each box being mounted adjacent an egg collecting conveyor such that an egg laid in a box rolls down the mat through the outlet opening onto the conveyor.
4. A system as claimed in claim 3 including the step of feeding hens within the poultry nesting house by delivering feed on a feed conveyor through the poultry nesting house, the feed conveyor travelling within a trough having a cover with a feeding opening sized for allowing access of a hen's head for feeding but preventing cocks feeding at the trough, a separate feeding trough being provided for cocks.
5. A system as claimed in any preceding claim wherein the fumigating room has a false ceiling with an inlet

- opening at one end of the fumigating room and an outlet opening at the opposite end of the fumigating room, a circulating fan being mounted at the inlet opening for circulating the fumigant gas through the false ceiling and the fumigated room.
- 5
6. A system as claimed in any preceding claim wherein after fumigation and prior to delivery of eggs to setting room, the process includes the step of heating the fumigating room to a desired temperature for pre-heating the eggs before delivery to the setting room.
- 10
7. A system as claimed in any preceding claim wherein at the checking station the eggs are checked by positioning each tray of eggs in turn over a matrix of lamps corresponding to the eggs on the tray to simultaneously back-light each egg on the tray for indicating the fertility of the eggs.
- 15
8. A system as claimed in any preceding claim including the step of washing the trays at a tray washing station after use by conveying each tray through sprays of detergent solution and then conveying the tray through sprays of a disinfectant solution.
- 20
9. A poultry egg processing system substantially as hereinbefore described with reference to the accompanying drawings.
- 25

17

**Patents Act 1977**  
**Examiner's report to the Comptroller under Section 17**  
**(The Search report)**

Application number  
GB 9507973.7

**Relevant Technical Fields**

- (i) UK Cl (Ed.N)      A1M (MFA, MFB, MFC, MFH); ASR  
(RCAX)
- (ii) Int Cl (Ed.6)      A01K 31/00, /14, /16, /17, 41/00, /02, /04,  
/06, 43/00, 45/00

Search Examiner  
R D CAVILL

Date of completion of Search  
7 JUNE 1995

**Databases (see below)**

(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

Documents considered relevant following a search in respect of Claims :-  
1 TO 9

(ii) ONLINE WPI:

**Categories of documents**

- X: Document indicating lack of novelty or of inventive step.      P: Document published on or after the declared priority date but before the filing date of the present application.
- Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.      E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.
- A: Document indicating technological background and/or state of the art.      &: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
Y	GB 2208315 A	(LEMONNIER) note vertically stacked trays on mobile racks and temp/humidity storage	1, 2, 3, 7
Y	GB 2166333 A	(STAALKAT) example of 'candling'	1, 2, 3, 7
Y	GB 2126093 A	(VINELAND) example of pneumatic vaccinator	1, 2, 3, 7
Y	GB 2071501 A	(VINELAND) example of pneumatic vaccinator	1, 2, 3, 7
Y	GB 2063673 A	(PAULS) note fumigator and mobile tray rack (Figure 10)	1, 2, 3, 7
Y	GB 2011774 A	(STAALKAT) example of 'candling'	1, 2, 3, 7
Y	GB 357523	(HILGERS) example of 'candling'	1, 2, 3, 7
Y	US 4681063	(HEBRANK) note suction transfer means	1, 2, 3, 7
Y	US 4364332	(SMITH) note egg collection means	3
Y	US 3965865	(KUNDIKOFT) example poultry transport tray	1, 2, 3, 7
Y	US 3049135	(KUHL) example of egg cleaning device	2

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